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ABSTRACT

Part of the series "Managing Highway Maintenance," the unit is designed for use with unit eight, level one, and unit 13, level two, and the certification tests for those units in the series. It contains typical management data and selected highway maintenance standards for the areas of: surface and shoulder; roadside and drainage; traffic services; maintenance improvement; snow and ice control; and administrative and overhead. The format is a programed, self-instructional approach in which information is presented in progressive segments or frames. (NH)

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MANAGING HIGHWAY MAINTENANCE

MANAGEMENT DATA AND MAINTENANCE STANDARDS

For Training in Maintenance Standards and Crew Scheduling

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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LEVELS 1&2

CE003237

FEDERAL HIGHWAY ADMINISTRATION
Offices of Research and Development
January 1973

This book is part of the series "Managing Highway Maintenance," prepared for the Implementation Division, Office of Development, Federal Highway Administration, under contract FH-11-7600. The series as a whole is described in the *Training Guide and Catalog* volume.

The contents of this book reflect the views of the contractor, Roy Jorgensen Associates, Inc. The contents do not necessarily reflect the official views or policy of the Department of Transportation.

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Implementation Division
Offices of Research and
Development

Washington, D.C.
January 1973

PREFACE

This booklet is used with Unit 8, Level 1; Unit 13, Level 2; and the Certification Tests for those units. It contains typical management data and selected highway maintenance standards. The map, resource listing and standards are modifications of actual data from several maintenance agencies.

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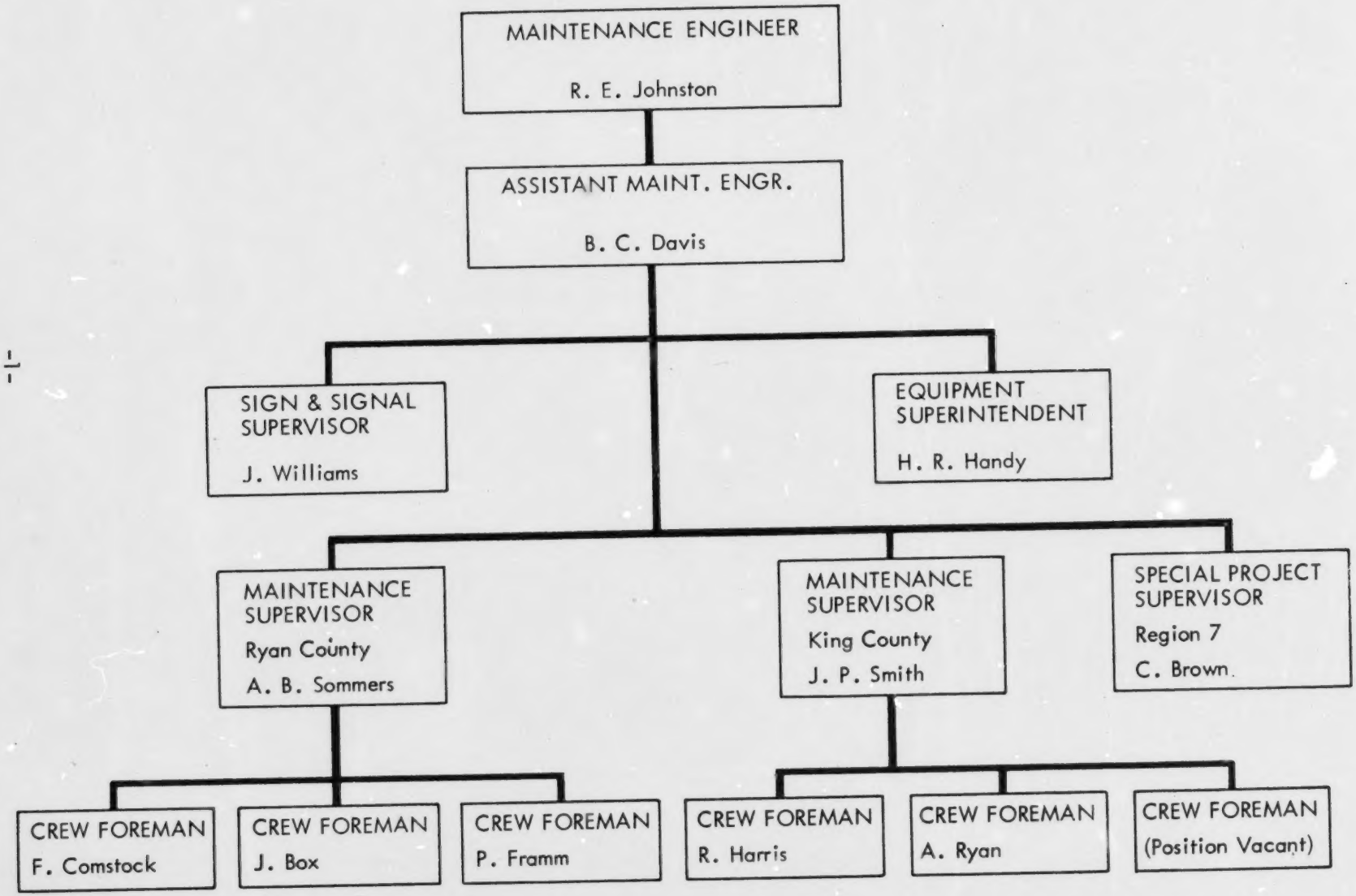
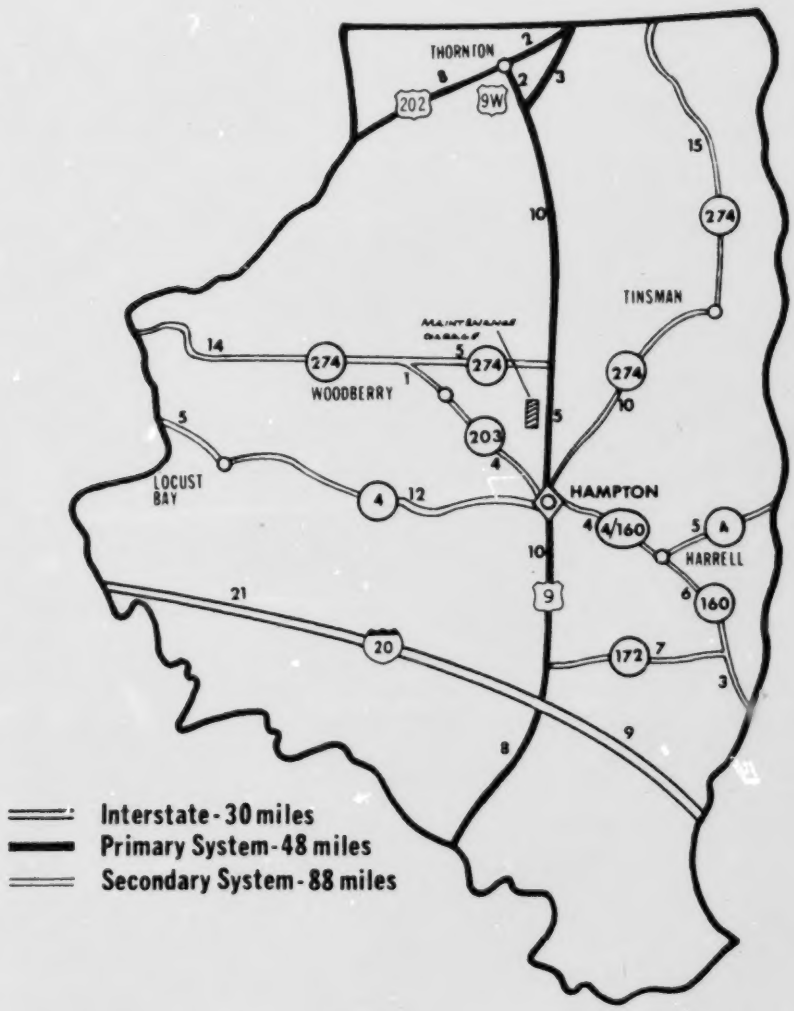
REGION 7 ORGANIZATION CHART



RYAN COUNTY ROAD MAP



RYAN COUNTY RESOURCE LISTING

PERSONNEL ROSTER

Position	Number
Maintenance Supervisor	1
Crew Foreman	3
Equipment Operator II	2
Equipment Operator I	3
Maintainer II	2
Maintainer I	5

ROAD MATERIALS STOCKPILED

Description		Quantity
Asphalt, MC-4	(gal.)	1500
Crushed stone, 31C $\frac{3}{8}$"	(c.y.)	210
Pit-run gravel	(c.y.)	320
River sand, full screen	(c.y.)	50
Cold mix	(ton)	80

MAINTENANCE EQUIPMENT

Group	Description	Number
01	Pickup truck -- $\frac{1}{2}$ ton	1
02	Pickup truck -- 6-passenger	1
03	Dump truck -- 25,000 GVW	3
04	Dump truck -- 32,000 GVW	3
05	Farm tractor -- with sickle bar	1
06	Farm tractor -- with 15' rotary	3
07	Utility backhoe -- $\frac{1}{2}$-$\frac{1}{3}$ buckets	1
08	Service truck -- $1\frac{1}{2}$ ton	2
09	Truck tractor -- diesel	
10	Farm tractor -- with power broom	1
11	Gradall	1
15	Steel-wheel roller -- towed	2
16	Rubber-tire roller -- 10-ton, towed	
17	Stump chipper -- towed	1
18	Mechanical sweeper -- gas/SP	
19	Compressor -- towed, with attach.	1
20	Trailer -- tandem float	
31	Water truck -- 1600-gal. cap.	
32	Motor grader -- diesel	2
33	Pull grader -- 40' wheel base	
34	Cat -- D-8 crawler	
36	Asphalt kettle -- 600-gal. cap.	1
37	Asphalt distributor -- 1600-gal. cap.	1
38	Front-end loader -- $1\frac{1}{2}$ c.y. bucket	1
39	FWD -- with one-way and wing	1
40	Chip spreader -- (fits Group 04)	1
55	Snowplow (fits Group 03/04)	3
57	Tailgate auger and spreader (fits Group 03/04)	5

MAINTENANCE WORK PROGRAM
AND MAN-HOUR REQUIREMENTS
FOR RYAN COUNTY – 1973

	ACTIVITY NUMBER AND NAME	WORK UNIT	PLANNED QUANTITY	MAN-HOUR REQUIREMENTS
Surface and Shoulder				
101	Joint and Crack Filling	Gallon of Sealant	775	310
102	Remove/Replace Concrete Pavement	Lane Foot	250	750
103	Premix Patching	Ton of Premix	90	450
104	Spot Sealing	Lane Mile	45	1,125
105	Bituminous Surface Replacement	Ton of Premix	810	730
111	Patching Base	Cubic Yard of Material	300	360
112	Spot Patching Shoulders	Cubic Yard of Material	80	360
113	Reshaping Shoulders	Pass Mile	1,720	1,720
119	Other Surface and Shoulder Maintenance	Man-Hour	1,900	1,900
Roadside and Drainage				
120	Tree Removal (Burning)	Inch (Diameter) of Tree	1,895	640
120	Tree Removal (Hauling)	Inch (Diameter) of Tree	950	325
121	Stump Removal	Each Stump	160	480
122	Clean Drainage Structures	Each Structure	580	520
123	Full-Width Litter Pickup	Pass Mile	320	1,280
124	Clean and Reshape Ditches	Ditch Mile	14	2,240
126	Machine Mowing	Acre	2,205	2,205
Traffic Services				
130	Replace Steel Beam Guardrail	Lineal Foot of Guardrail	85	55
131	Sweeping and Flushing	Mile	125	200
133	Sign Maintenance [1]	Man-Hour	3,280	3,280
134	Signal Maintenance	Man-Hour	810	810
Maintenance Improvement				
150	General Bridge Maintenance	Man-Hour	605	605
159	Other General Maintenance [2]	Man-Hour	2,200	2,200
Snow and Ice Control				
160	Spreading Salt	Pass Mile	4,010	400
161	Plowing Snow	Pass Mile	3,250	195
Administrative and Overhead				
170	Building Maintenance	Man-Hour	420	420
171	Ground Maintenance	Man-Hour	800	800
180	Administrative Overhead	Man-Hour	6,650	6,650
			Total Planned Man-Hours	31,010

[1] Includes 1,050 man-hours required to replace all directional signs.

[2] Includes 900 man-hours estimated to do special shoulder project.

CUMULATIVE WORK PROGRAM AND MAN-HOUR SUMMARY

FOR RYAN COUNTY

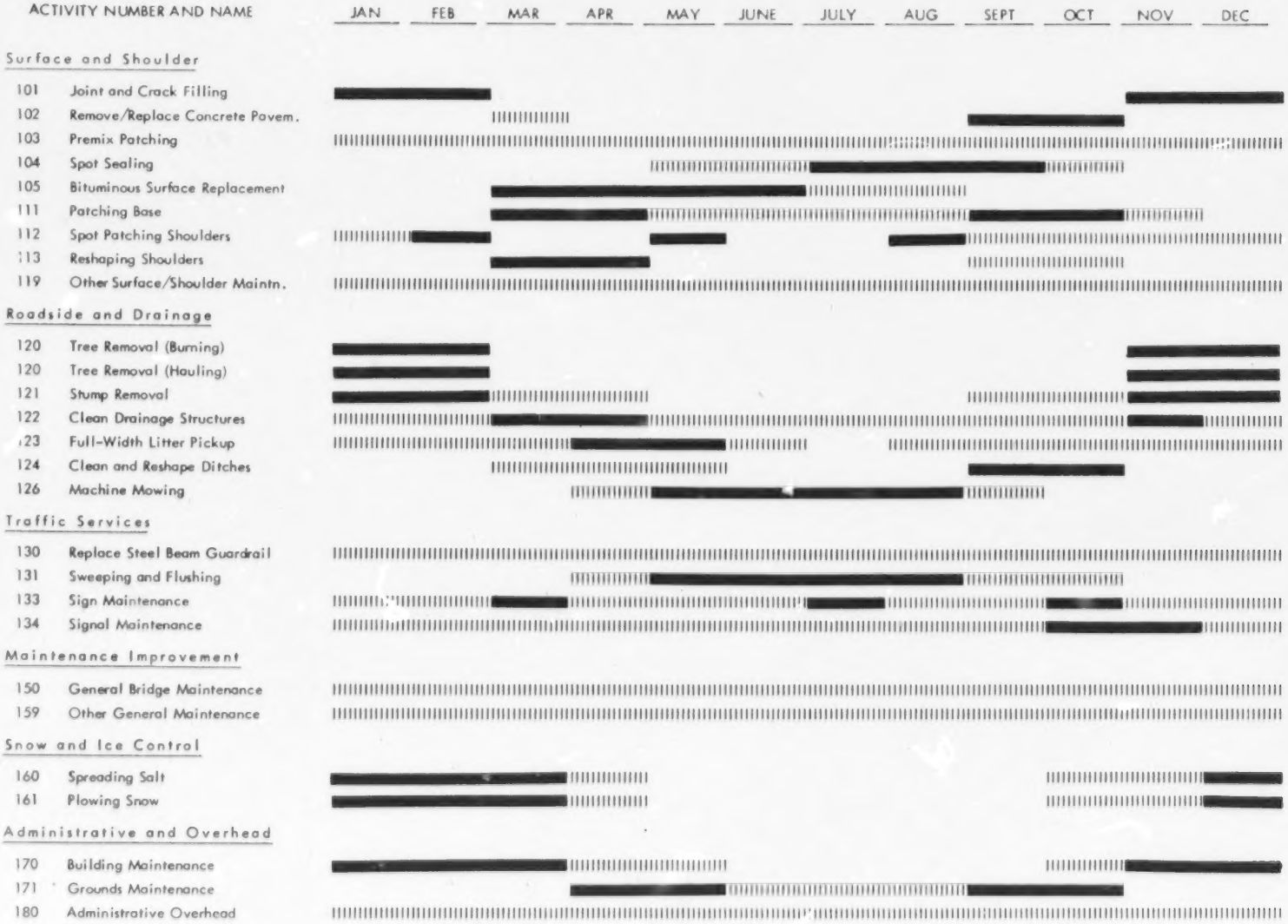
July 1, 1972 – March 31, 1973

	ACTIVITY NUMBER AND NAME	WORK UNIT	QUANTITY TO DATE PLANNED	QUANTITY TO DATE ACTUAL	MAN-HOURS TO DATE PLANNED	MAN-HOURS TO DATE ACTUAL
Surface and Shoulder						
101	Joint and Crack Filling	Gallon	775	727	310	351
102	Remove/Replace Concrete Pavement	Lane Foot	225	233	675	628
103	Premix Patching	Ton	68	76	340	350
104	Spot Sealing	Lane Mile	40	31	1,000	875
105	Bituminous Surface Replacement	Ton	600	605	540	531
111	Patching Base	Cubic Yard	120	55	145	103
112	Spot Patching Shoulders	Cubic Yard	60	63	270	288
113	Reshaping Shoulders	Pass Mile	825	792	825	720
119	Other Surface and Shoulder Maintenance	Man-Hour	1,425	1,685	1,425	1,685
Roadside and Drainage						
120	Tree Removal (Burning)	Inch (Diameter)	1,895	1,905	640	686
120	Tree Removal (Hauling)	Inch (Diameter)	950	621	325	521
121	Stump Removal	Each Stump	160	65	480	210
122	Clean Drainage Structures	Each Structure	490	461	440	801
123	Full-Width Litter Pickup	Pass Mile	150	145	600	550
124	Clean and Reshape Ditches	Ditch Mile	12	14	760	729
126	Machine Mowing	Acre	1,650	1,421	1,650	1,445
Traffic Services						
130	Replace Steel Beam Guardrail	Lineal Foot	65	35	40	38
131	Sweeping and Flushing	Mile	75	75	120	115
133	Sign Maintenance[1]	Man-Hour	2,100	2,875	2,100	2,875
134	Signal Maintenance	Man-Hour	730	586	730	586
Maintenance Improvement						
150	General Bridge Maintenance	Man-Hour	800	721	800	721
159	Other General Maintenance[2]	Man-Hour	1,650	1,280	1,650	1,280
Snow and Ice Control						
160	Spreading Salt	Pass Mile	4,010	6,051	400	621
161	Plowing Snow	Pass Mile	3,250	3,720	195	256
Administrative and Overhead						
170	Building Maintenance	Man-Hour	310	252	310	252
171	Grounds Maintenance	Man-Hour	600	651	600	651
180	Administrative Overhead	Man-Hour	5,000	4,685	5,000	4,685
	TOTAL CUMULATIVE MAN-HOURS				22,370	22,553

[1] Includes 1,050 man-hours required to replace all directional signs.

[2] Includes 900 man-hours estimated to do special shoulder project.

WORK SCHEDULING CALENDAR



LEGEND: ▬ Periods of expected performance. ||||||| Periods of possible performance. (Blank) Periods when the activity usually should not be scheduled.

SUMMARY TABLE OF MAINTENANCE ACTIVITIES

ACTIVITY NUMBER AND NAME		WORK UNIT	CREW SIZE	DAILY PRODUCTION	AVERAGE PRODUCTIVITY
Surface and Shoulder					
101	Joint and Crack Filling	Gallon of sealant	7	100–250 gallons	0.4 man-hours/gallon of sealant
102	Remove/Replace Concrete Pavement	Lane foot	6	16–22 lane feet	3.0 man-hours/lane foot
103	Premix Patching	Ton of premix	2	2–4 tons	5.0 man-hours/ton of premix
104	Spot Sealing	Lane mile	8	2–3 lane miles	25.0 man-hours/lane mile
105	Bituminous Surface Replacement	Ton of premix	7	56–70 tons	0.9 man-hours/ton of premix
111	Patching Base	Cubic yard of material	7	45–50 cubic yards	1.2 man-hours/cubic yard of material
112	Spot Patching Shoulders	Cubic yard of material	2	2.9 – 4.5 cubic yards	4.5 man-hours/cubic yard of material
113	Reshaping Shoulders	Pass mile	1	7–9 pass miles	1.0 man-hours/pass mile
119	Other Surface and Shoulder Maintenance	Man-hour	(as required)	n.a.	n.a.
Roadside and Drainage					
120	Tree Removal (Burning)	Inch (diameter) of tree	5	100–140 inches	0.3 man-hours/inch (diameter) of tree
120	Tree Removal (Hauling)	Inch (diameter) of tree	5	110–130 inches	0.3 man-hours/inch (diameter) of tree
121	Stump Removal	Each stump	2	4–7 stumps	3.0 man-hours/stump
122	Clean Drainage Structures	Each structure	2	18–27 structures	0.9 man-hours/structure
123	Full-Width Litter Pickup	Pass mile	2–3	4–6 pass miles	4.0 man-hours/pass mile
124	Clean and Reshape Ditches	Ditch mile	6	0.2 – 0.4 miles	160.0 man-hours/ditch mile
126	Machine Mowing	Acre	1	7–9 acres	1.0 man-hours/acre
Traffic Services					
130	Replace Steel Beam Guardrail	Lineal foot of guardrail	3	26–48 lineal feet	0.6 man-hours/lineal foot of guardrail
131	Sweeping and Flushing	Mile	2	7–13 miles	1.6 man-hours/mile
133	Sign Maintenance	Man-hour	2	n.a.	n.a.
134	Signal Maintenance	Man-hour	2	n.a.	n.a.
Maintenance Improvement					
150	General Bridge Maintenance	Man-hour	2–8	n.a.	n.a.
159	Other General Maintenance	Man-hour	(as required)	n.a.	n.a.
Snow and Ice Control					
160	Spreading Salt	Pass mile	1	70–90 pass miles	0.1 man-hours/pass mile
161	Plowing Snow	Pass mile	1	100–130 pass miles	0.1 man-hours/pass mile (rounded from 0.06)
Administrative and Overhead					
170	Building Maintenance	Man-hour	(as required)	n.a.	n.a.
171	Grounds Maintenance	Man-hour	(as required)	n.a.	n.a.
180	Administrative Overhead	Man-hour	n.a.	n.a.	n.a.

NOTE: Where hauling is required, standard crew size is based on a 20-mile round trip.
As a general guide, add to standard, one truck (03/04) and driver for each additional 10 miles.

MAINTENANCE STANDARD

JOINT AND CRACK FILLING

April 17, 1972 — Activity No. 101

DESCRIPTION AND PURPOSE:

Cleaning and filling with liquid sealant, asphalt surface cracks which are greater than $\frac{1}{4}$-inch wide.

SCHEDULING:

Schedule this work when the temperature is not expected to be above 50°F.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 7

(Add flagmen as needed.)

Equipment:

No.	Description	Group
2	Trucks	03
1	Truck	02
1	Asphalt kettle (600 or 300 as avail.)	36
1	Compressor	19

(Flashing arrow, truck or trailer mounted, may be added as needed for traffic control.)

ACCOMPLISHMENT

Work Unit: Gallon of sealant

Daily Production: 100-250 gallons

Average Productivity: 0.4 man-hours/gallon of sealant

MATERIAL

Sealant
Sand or 31C (3/8" stone maximum)

RECOMMENDED PROCEDURE:

1. Before filling, clean cracks with air compressor.
2. Apply sealant heated to the specified application temperature.
3. Fill cracks to within $\frac{1}{4}$ inch of the top of the surface to allow for expansion.
4. To prevent tracking, blot with sand or 3/8" stone -- depending on width of joint or crack.

CRITERION -- ONLY CRACKS GREATER THAN $\frac{1}{4}$ INCH (PENCIL DIAMETER) WILL BE FILLED.

MAINTENANCE STANDARD

REMOVE/REPLACE CONCRETE PAVEMENT

April 17, 1972 Activity No. 102

DESCRIPTION AND PURPOSE:

Removal of broken concrete slabs and replacement with compacted soils and premix material to achieve a level surface.

SCHEDULING:

Schedule primarily during summer, but perform as needed.

TYPE OF ACTIVITY:

Emergency Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 6

(Add flagmen as needed.)

Equipment:

No.	Description	Group
3	Trucks	03
1	Front-end loader	38
1	Air compressor	19
1	Steel roller	15
1	Vibratory compactor	15

(Flashing arrow, truck or trailer mounted, may be added as needed for traffic control.)

ACCOMPLISHMENT

Work Unit: Lane foot

Daily Production: 16-22 lane feet

Average Productivity: 3.0 man-hours/lane foot

MATERIAL

Premix
Bond Coat AE-3
Gravel 23-A
Sand

RECOMMENDED PROCEDURE:

1. Remove full depth concrete slab for each lane width.
   a. Use pavement breaker or air hammer to break up slab.
   b. If a saw is used, cut the surface to a minimum depth of $2\frac{1}{2}$".
2. Cut and remove reinforcing rod where needed.
3. Remove all large broken concrete from hole.
4. Perform necessary minor base repair.
5. Fill the hole:
   a. Gravel or bituminous base course -- maximum 3" layers, compacted.
   b. Prime exposed edges of slab as necessary.
   c. Place premix material in layers of 2" each, and complete with a wearing course on top. Compact layers separately. The finished surface should be flush with adjacent pavement and in line with pavement edge.

NOTES: (1) Minimum thickness of bituminous material when complete, should not be less than $2\frac{1}{2}$".

(2) Remove debris as necessary.

(3) Pavement sawing is performed under Activity 119, Other Surface and Shoulder Maintenance.

MAINTENANCE STANDARD

PREMIX PATCHING

April 17, 1972 — Activity No. 103

DESCRIPTION AND PURPOSE:

Hand-tool patching with bituminous premix material to correct scattered potholes, edge failures and severe depressions, to eliminate potential surface hazards.

SCHEDULING:

Schedule as necessary.

TYPE OF ACTIVITY:

Emergency Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 2

(Add flagmen as needed)

Equipment:

No.	Description	Group
1	Truck	03

ACCOMPLISHMENT

Work Unit: Ton of premix

Daily Production: 2-4 tons

Average Productivity: 5.0 man-hours/ton of premix

MATERIAL

Premix
Bond Coat AE3

RECOMMENDED PROCEDURE:

1. Remove loose or broken material.
2. Square up the area and make any vertical cuts needed.
3. Tack the area.
4. Place premix -- in layers.
5. Tamp each layer.
6. Check the finished surface.
7. Broom loose, excess material.

MAINTENANCE STANDARD

SPOT SEALING

April 17, 1972 Activity No. 104

DESCRIPTION AND PURPOSE:

Surface sealing with liquid asphalt and aggregate to protect the existing surface, to add skid resistance and to seal open cracks.

SCHEDULING:

Do not schedule during winter months.

TYPE OF ACTIVITY:

Special Authority

CREW/EQUIPMENT

Recommended Crew Size: 8

(Add flagmen as needed.)

Equipment:

No.	Description	Group
3	Dump trucks	04
1	Asphalt distributor	37
1	Roller	15
1	Chip spreader	40
1	Power broom	10

ACCOMPLISHMENT

Work Unit: Lane mile

Daily Production: 2-3 lane miles

Average Productivity: 25.0 man-hours/lane mile

MATERIAL

Liquid asphalt
Gravel 31-C

RECOMMENDED PROCEDURE:

1. Correct distorted or settled areas before sealing.
2. Sweep all loose debris from pavement.
3. Apply liquid asphalt heated to proper temperature. Work one lane at a time. (Application rate of .25 gal. per square yard)
4. Apply cover material with mechanical spreader immediately. (Application rate of 23 pounds of stone per square yard.)
5. Roll entire sealed area.
6. Remove excess stone from pavement if necessary.

MAINTENANCE STANDARD

BITUMINOUS SURFACE REPLACEMENT

April 17, 1972 **Activity No. 105**

DESCRIPTION AND PURPOSE:

Removal and disposal of bituminous surfacing from deteriorated areas and replacement with premix material -- to correct broken and crumbled surface.

SCHEDULING:

Schedule according to scheduling calendar.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 7

(Add flagmen as needed.)

Equipment:

No.	Description	Group
3	Trucks	04
1	Asphalt kettle	36
1	Roller	15
1	Motor grader	32

ACCOMPLISHMENT

Work Unit: Ton of premix

Daily Production: 56-70 tons

Average Productivity: 0.9 man-hours/ton of premix

MATERIAL

Premix
Bond Coat AE-3

RECOMMENDED PROCEDURE:

1. Break up and remove the old surface material from the cracked or broken area.
2. Shape up the hole and trim edges back into good solid surface with vertical sides.
3. Apply a tack coat of liquid bituminous material.
4. Place premix in the hole, first around the sides, then toward the center, in layers not to exceed 3 inches in depth.
5. Compact each layer before placing the next.
6. Shape the final layer until it is smooth and level with the surrounding surface.
7. Broom loose, excess material from roadway surface.

MAINTENANCE STANDARD

PATCHING BASE

April 17, 1972 — Activity No. 111

DESCRIPTION AND PURPOSE:

Repair of base or subgrade failures under bituminous pavements through the excavation of unsatisfactory material and replacement with concrete, aggregate or other material to correct possible hazards and to preserve the roadway.

SCHEDULING:

Schedule primarily during summer.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 7

(Add flagmen as needed.)

Equipment:

No.	Description	Group
3	Dump trucks	03
1	Pickup truck	01
1	Gradall	11
1	Rubber-tire roller	16

ACCOMPLISHMENT

Work Unit: Cubic yard of material

Daily Production: 45-50 cubic yards

Average Productivity: 1.2 man-hours/cubic yard of material

MATERIAL

Crushed concrete, pit-run gravel or aggregate

RECOMMENDED PROCEDURE:

1. Cut out surface failures with Gradall or other suitable equipment.
2. Remove unsatisfactory base or subgrade material.
3. Load unsatisfactory material into truck, haul away and dispose at predesignated area.
4. If water under the pavement caused failure, build a small trench out to the ditch and fill with coarse granular material before resurfacing.
5. Place new base material in layers in cut-out section.
6. Compact each layer with hand tamps and roller.
7. Compact the final layer until it is level with the surrounding base.
8. Replace surfacing as under Activity No. 105.

MAINTENANCE STANDARD

SPOT PATCHING SHOULDERS

April 17, 1972 Activity No. 112

DESCRIPTION AND PURPOSE:

Patching of non-paved shoulders, to include edge rutting and minor repair.

SCHEDULING:

Schedule this work as an alternate activity. Perform during rainy weather.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 2

Equipment:

No.	Description	Group
1	Truck	03

ACCOMPLISHMENT

Work Unit: Cubic yard of material

Daily Production: 2.9-4.5 cubic yards

Average Productivity: 4.5 man-hours/cubic yard of material

MATERIAL

Pit-run gravel

RECOMMENDED PROCEDURE:

1. Spread pit-run gravel from truck.
2. Hand rake until level with surrounding shoulder.

MAINTENANCE STANDARD

RESHAPING SHOULDERS

April 17, 1972 Activity No. 113

DESCRIPTION AND PURPOSE:

Blading and shaping of non-paved shoulders without additional material -- to keep the shoulder flush with the pavement, smooth out ruts and provide the proper grade.

SCHEDULING:

Schedule during spring and fall.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 1

Equipment:

No.	Description	Group
1	Motor grader	.32

ACCOMPLISHMENT

Work Unit: Pass mile

Daily Production: 7-9 pass miles

Average Productivity: 1.0 man-hour/pass mile

MATERIAL

None

RECOMMENDED PROCEDURE:

1. Perform routine blading with outside corner of the blade flush with or slightly above existing shoulder grade.
2. Remove all material from the pavement surface and spread without leaving a windrow.

NOTES: (1) Blading should be scheduled to take advantage of natural moisture on the shoulders, to ensure compaction.

(2) See training guide for additional work procedures.

MAINTENANCE STANDARD

OTHER SURFACE AND SHOULDER MAINTENANCE

April 17, 1972 Activity No. 119

DESCRIPTION AND PURPOSE:

Other surface and shoulder maintenance activities not covered by Activities 101-113. See list of activities below.

SCHEDULING:

Schedule as required.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT	ACCOMPLISHMENT
Recommended Crew Size: (as required)	**Work Unit:** Man-hour
Equipment:	**Daily Production:** N/A.
No. Description Group	**Average Productivity:** N/A
(as required)	**MATERIAL**
	(as required)

RECOMMENDED PROCEDURE:

OTHER SURFACE AND SHOULDER MAINTENANCE includes:

Temporary repairs, including blowups.

CRITERION: As blowup is discovered, sweep up debris; if pavement is heaved, relieve pressure when possible; and complete temporary (emergency) patch as soon as possible. (Overtime is authorized.) At first opportunity, complete with permanent patch.

Bump burning

Cleaning holes with compressor

Sawing concrete prior to performing Activity 102.

Frost boring

Premix leveling to correct surface irregularities.

MAINTENANCE STANDARD

TREE REMOVAL

April 17, 1972 — Activity No. 120

DESCRIPTION AND PURPOSE:

Removal of trees greater than 8" in diameter (except stumps), including cleanup to ensure that the remaining stump is not hazardous to cars that leave the roadway.

SCHEDULING:

Schedule as fill-in work.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 5
(Add flagmen as needed.)

Equipment:

No.	Description	Group
1	Truck	03
1	Truck	02
1	Loader	38
2	One-man chain saws	
1	Two-man chain saw	

ACCOMPLISHMENT

Work Unit: Inch (of diameter) of tree

Daily Production: 100-140 inches (burning)
110-130 inches (hauling)

Average Productivity: 0.3 man-hours/inch (d) of tree

MATERIAL

None

RECOMMENDED PROCEDURE:

1. If necessary, remove branches before felling a tree.
2. If necessary, attach a line to ensure proper direction of fall.
3. Cut and fell the tree, then clear the roadway of debris as required.
4. If on-site burning is possible, ensure it is done well off the roadway. If burning is unsafe or impossible on site, haul wood for burning or disposal to an authorized area. The burning of trees, logs, brush and stumps in rural areas should be done only where it does not create a nuisance, fire or health hazard and does not restrict traffic vision. (See Note 2 below.)
5. If required, recut the stump as close to the ground as possible.

NOTES:

(1) Contact property owner if tree is not on Department right-of-way.

(2) Permits are required in some areas for open burning. NEVER use tires, plastics and similar materials to help start fires.

MAINTENANCE STANDARD

STUMP REMOVAL

April 17, 1972 Activity No. 121

DESCRIPTION AND PURPOSE:

Removal of tree stumps to eliminate potential roadside hazards and improve the appearance of the roadside.

SCHEDULING:

Schedule as fill-in work.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 2

Equipment:

No.	Description	Group
1	Pickup	02
1	Stump chipper	17

ACCOMPLISHMENT

Work Unit: Each stump

Daily Production: 4-7 stumps

Average Productivity: 3.0 man-hours/stump

MATERIAL

Topsoil
Grass seed
Mulch

RECOMMENDED PROCEDURE:

1. Remove stump with stump chipper to 6" below final ground elevation.
2. Remove stump chips.
3. Backfill area with suitable topsoil.
4. Seed and mulch area.

CAUTION: Stump chippers should be operated only by adequately trained personnel wearing appropriate safety apparel.

MAINTENANCE STANDARD

CLEAN DRAINAGE STRUCTURES

April 17, 1972 Activity No. 122

DESCRIPTION AND PURPOSE:

Cleaning of catch basins, culverts and manholes by removal of accumulated dirt and debris to ensure proper drainage.

SCHEDULING:

All drainage structures will be cleaned once annually with a second cleaning performed if necessary. Check scheduling calendar.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 2

Equipment:

No.	Description	Group
Mechanical		
1	Sewer rooter	16
Manual		
1	Truck	03

(A truck-mounted flashing arrow should be used where traffic conditions warrant.)

ACCOMPLISHMENT

Work Unit: Each structure

Daily Production: 18-27 structures

Average Productivity: 0.9 man-hours/struct.

MATERIAL

None

RECOMMENDED PROCEDURE:

MECHANICAL

1. After removing and cleaning cover, check depth of solid debris to determine what cleaning is necessary.
2. As required, loosen solids with water pressure (agitator).
3. Check interior for sewer gas and then check the condition of the structure.
4. Carefully clean ring seat before replacing cover.

MANUAL

1. Following removal and cleaning of cover, remove solid debris with a long-handled shovel.
2. If the structure is deep, check for sewer gas prior to entering structure. Use the rope and pail technique for further removal of debris.
3. Conduct a visual inspection of the structure interior to determine if further cleaning or repair is necessary.
4. Carefully clean ring seat before replacing cover.

MAINTENANCE STANDARD

FULL-WIDTH LITTER PICKUP

April 17, 1972 Activity No. 123

DESCRIPTION AND PURPOSE:

Scheduled litter pickup of the full width of right-of-way to remove unsightly or hazardous objects.

SCHEDULING:

The litter pickup of the full width is to be performed once a year.
Check the scheduling calendar.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 2 - 3

2 -- R/W less than 100 feet
3 -- R/W greater than 100 feet

Equipment:

No.	Description	Group
1	Truck	03

ACCOMPLISHMENT

Work Unit: Pass mile

Daily Production: 4-6 pass miles

Average Productivity: 4.0 man-hours/pass mile

MATERIAL

None

RECOMMENDED PROCEDURE:

1. Collect small debris with containers.
2. Place large items directly on truck.
3. Cover truck box to contain litter when necessary.
4. Dispose of litter at designated areas.

MAINTENANCE STANDARD

CLEAN AND RESHAPE DITCHES

April 17, 1972 Activity No. 124

DESCRIPTION AND PURPOSE:

Cleaning and reshaping roadway ditches to restore the original flow line and grade; to include loading, hauling and disposal of ditch sediment.

SCHEDULING:

Check scheduling calendar.

TYPE OF ACTIVITY:

Special Authority

CREW/EQUIPMENT

Recommended Crew Size: 6

(Add flagmen as needed.)

Equipment:

No.	Description	Group
3	Trucks	04
1	Front-end loader	38
1	Motor grader	31

ACCOMPLISHMENT

Work Unit: Ditch mile

Daily Production: 0.2 - 0.4 miles

Average Productivity: 160 man-hours/ditch mile

MATERIAL

None

RECOMMENDED PROCEDURE:

1. Provide adequate outlet for water, establish flowline of ditch, and provide dumping spot for dirt removed.
2. Remove excess dirt with grader and windrow on shoulder for pickup by loader. Keep interference with traffic at a minimum.
3. Do not cut V-bottom ditches. Six-foot, flat-bottom ditches are minimum requirements.
4. Dress, mulch and seed slopes as needed for erosion control.

MAINTENANCE STANDARD

MACHINE MOWING

April 17, 1972 — Activity No. 126

DESCRIPTION AND PURPOSE:

Machine mowing (except guardrail or slope mowing) to accomplish neat, uniform roadside grassy area.

SCHEDULING:

Schedule according to the scheduling calendar.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 1
(See note below.)

Equipment:

No.	Description	Group
1	Mower	05
	or	
1	Mower	06
1	Service Truck	08

ACCOMPLISHMENT

Work Unit: Acre

Daily Production: 7-9 acres

Average Productivity: 1.0 man-hours/acre

MATERIAL

None

RECOMMENDED PROCEDURE:

Mowing is machine-paced. Each mower should work independently, but should remain within visual contact of other mowers.

1. Each garage should compute the number of acres to be mowed and develop a plan for mowing.

2. Designate a specific area of work for each type of mower on any section so as to reduce turning, unnecessary passes and mower congestion. When making assignments, consider the following:

   + Fifteen-foot rotary mowers (single-unit with bat wings) work best on the wider areas where few obstructions exist. Assign these mowers where they can mow one, three, five and other odd number passes.
   + Single-unit rotary mowers, 8-foot and under, work best on wide shoulders and foreslopes and for mowing around signs, ramps, etc.
   + Sickle-bar mowers basically are less productive and work best for mowing around obstructions, on narrow shoulders, "V" ditches, etc.

NOTE: Add 1 to 3 mowers and men to the basic equipment and crew size -- whenever the mowable width and type of terrain indicate that a section of roadside can best be mowed by a team of 2 to 4 mowers.

MAINTENANCE STANDARD

REPLACE STEEL BEAM GUARDRAIL

April 17, 1972 Activity No. 130

DESCRIPTION AND PURPOSE:

Replacement of damaged steel beam guardrail sections, posts and hardware, and realignment as a result of traffic accidents as well as routine replacement needs.

SCHEDULING:

Scheduling of guardrail repair has top priority.

TYPE OF ACTIVITY:

Emergency Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 3

(Add flagmen as needed.)

Equipment:

No.	Description	Group
1	Truck	03
1	Chain saw	

Under frost conditions, add one compressor.

Equipment for larger jobs to include: generator, post-hole auger, compressor, or front-end loader as needed.

ACCOMPLISHMENT

Work Unit: Lineal foot of guardrail

Daily Production: 26-48 lineal feet

Average Productivity: 0.6 man-hours/lineal foot of guardrail

MATERIAL

Beam sections; straight and/or curved end shoes.

Treated timber or steel posts and hardware.

RECOMMENDED PROCEDURE:

1. Survey damage and draw necessary repair materials from stores.
2. After removing parts damaged beyond repair, replace parts:
   a. Realign loose posts and compact earth around them.
   b. Install new posts to depth of 4 feet.
   c. Install hardware according to standard plan.
3. Clean up debris and regrade shoulders as necessary.

MAINTENANCE STANDARD

SWEEPING AND FLUSHING

April 17, 1972 Activity No. 131

DESCRIPTION AND PURPOSE:

Routine mechanical sweeping to remove loose material. Includes the sweeping of curbs, gutters and roadway.

SCHEDULING:

Schedule during the summer months.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 2

Equipment:

No.	Description	Group
1	Tractor	05
1	Broom	10
	or	
1	Mechanical sweeper	18
1	Dump truck	04

ACCOMPLISHMENT

Work Unit: Mile

Daily Production: 7-13 miles

Average Productivity: 1.6 man-hours/mile

MATERIAL

None

RECOMMENDED PROCEDURE:

See operator's manual.

NOTE: Emergency sweeping of debris which can be caused by accidents or storms falls under Activity 159, Other General Maintenance.

MAINTENANCE STANDARD

SIGN MAINTENANCE

April 17, 1972 Activity No. 133

DESCRIPTION AND PURPOSE:

Repair or replacement of all traffic control signs whose state of disrepair endangers the safety of the motorist.

SCHEDULING:

See procedure below.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 2

Equipment:

No.	Description	Group
1	Truck	08
	or	
1	Truck	03

ACCOMPLISHMENT

Work Unit: Man-hour

Daily Production: N/A

Average Productivity: N/A

MATERIAL

Regulatory, directional or warning signs

RECOMMENDED PROCEDURE:

1. The following traffic signs are to receive first priority maintenance -- immediate service -- 24-hour basis:

   STOP
   YIELD
   CURVE with advisory speed panel
   TARGET ARROW for same curve.

2. "Watch for ICE on bridge" signs shall be turned 90 degrees facing away from the appropriate roadway in the month of May, and returned to face traffic during October each year.

3. Each garage shall carry a minimum supply of first priority signs and any other regulatory or warning signs which, if damaged by accident, would endanger the safety of motorists.

MAINTENANCE STANDARD

SIGNAL MAINTENANCE

April 17, 1972 Activity No. 134

DESCRIPTION AND PURPOSE:

Repair or replacement of all traffic control devices whose state of disrepair endangers the safety of the motorist.

SCHEDULING:

See procedure below.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 2

Equipment:

No.	Description	Group
1	Truck	08
	or	
1	Truck	03

ACCOMPLISHMENT

Work Unit: Man-hour

Daily Production: N/A

Average Productivity: N/A

MATERIAL

(as required)

RECOMMENDED PROCEDURE:

1. Direct maintenance personnel shall perform only necessary emergency signal maintenance to keep the highway open and as safe as possible until the Head Office Electrician and/or the local law enforcement agent arrives.

2. Maintenance of electrical traffic control devices shall be referred to the Head Office Electrician.

MAINTENANCE STANDARD

GENERAL BRIDGE MAINTENANCE

April 17, 1972 Activity No. 150

DESCRIPTION AND PURPOSE:

Maintenance or replacement of all bridges, to include repairs to piling, decking, abutments and railing.

SCHEDULING:

Schedule according to the scheduling calendar.

TYPE OF ACTIVITY:

Maintenance Improvement

CREW/EQUIPMENT

Recommended Crew Size: 2 - 8 *

(Add flagmen as needed.)

Equipment:

No.	Description	Group
(as required)		

ACCOMPLISHMENT

Work Unit: Man-hour

Daily Production: N/A

Average Productivity: N/A

MATERIAL

(as required)

RECOMMENDED PROCEDURE:

NOTE: Complete bridge standards are to be published in December 1973.

* This work usually can be done by a small crew, especially in the case of painting and abutment repair.

MAINTENANCE STANDARD

OTHER GENERAL MAINTENANCE

April 17, 1972 **Activity No. 159**

DESCRIPTION AND PURPOSE:

All other general maintenance to surface, shoulders and roadside, not covered by Activities 101-134.

SCHEDULING:

Schedule as necessary.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT	ACCOMPLISHMENT
Recommended Crew Size: (as required)	**Work Unit:** Man-hour
Equipment:	**Daily Production:** N/A
No. **Description** **Group**	**Average Productivity:** N/A
(as required)	**MATERIAL**
	(as required)

RECOMMENDED PROCEDURE:

Maintenance work covered by this activity includes:

+ Isolated litter pickup
+ Painting of sign posts and bridge markers
+ Hand-mowing
+ Other roadside and drainage work
+ Other traffic services, to include pavement striping.
+ Maintenance improvements and betterments.

MAINTENANCE STANDARD

SPREADING SALT

April 17, 1972 Activity No. 160

DESCRIPTION AND PURPOSE:

Applying salt on continuous stretches of highways to eliminate general slippery conditions.

SCHEDULING:

Schedule as necessary.

TYPE OF ACTIVITY:

Emergency Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 1

Equipment:

No.	Description	Group
1	Truck	03/04
1	Tailgate auger and spreader	57

ACCOMPLISHMENT

Work Unit: Pass mile

Daily Production: 70-90 pass miles

Average Productivity: 0.1 man-hours/pass mile

MATERIAL

Salt

RECOMMENDED PROCEDURE:

1. Apply salt at an application rate of 450 lbs. per two-lane mile under most conditions. Cab application settings should be set for the average traveling speed maintained (15 mph or 20 mph, depending on location and conditions). MAINTAIN AVERAGE SPEED FOR UNIFORM APPLICATIONS.

2. Consider general temperature and weather conditions in deciding which winter operation to perform:

   + Below 10°F -- plowing is recommended.
   + 10 - 20° F -- plowing and salting are recommended.
   + Above 20°F -- salting is recommended.

   For changing conditions, refer to the Winter Operations Guide.

3. Avoid salting too early during extreme cold and falling temperature. Salt wets the pavement and may create icy conditions.

4. Spreader spinner should create a pattern 18' wide except on narrow streets where a 12' pattern should be used. Center of pattern should be on centerline except on superelevated curves, ramps and widened sections of roadway.

MAINTENANCE STANDARD

PLOWING SNOW

April 17, 1972 Activity No. 161

DESCRIPTION AND PURPOSE:

Clearing of snow, ice or slush from roadway surfaces or shoulders.

SCHEDULING:

Schedule as necessary.

TYPE OF ACTIVITY:

Emergency Maintenance

CREW/EQUIPMENT

Recommended Crew Size: 1

Equipment:

No.	Description	Group
1	Truck	03/04
1	Snow plow	55

ACCOMPLISHMENT

Work Unit: Pass mile

Daily Production: 100-130 pass miles

Average Productivity: 0.06 man-hours/pass mile

MATERIAL

RECOMMENDED PROCEDURE:

1. Maintain adequate speed for the plow to throw snow.
2. Do not blind following vehicles. Occasionally stop to allow traffic to clear.
3. Be careful of obstacles, soft shoulders and turnarounds too tight for a truck and plow.
4. At railroad crossings, raise plow and remove snow accumulated on the crossing.
5. Do not throw snow off overpasses.

MAINTENANCE STANDARD

BUILDING MAINTENANCE

April 17, 1972 Activity No. 170

DESCRIPTION AND PURPOSE:

Time, equipment and materials chargeable to the Head Office as per current regulations. This work includes all cleaning, painting and other maintenance of buildings, shops and garages.

SCHEDULING:

This is "rainy weather" work.
Do not schedule during fair weather.

TYPE OF ACTIVITY:

Non-Maintenance

CREW/EQUIPMENT	ACCOMPLISHMENT
Recommended Crew Size: (as required)	**Work Unit:** Man-hour
Equipment:	**Daily Production:** N/A
No. **Description** **Group**	**Average Productivity:** N/A
(as required)	**MATERIAL**
	(as required)

RECOMMENDED PROCEDURE:

MAINTENANCE STANDARD

GROUNDS MAINTENANCE

April 17, 1972 Activity No. 171

DESCRIPTION AND PURPOSE:

The maintenance and cleaning of all outside areas except those used specifically for maintenance operations or storage areas where maintenance materials are kept.

SCHEDULING:

This work includes normal park and sidewalk maintenance.

TYPE OF ACTIVITY:

Routine Maintenance

CREW/EQUIPMENT	ACCOMPLISHMENT
Recommended Crew Size: (as required)	**Work Unit:** Man-hour
Equipment:	**Daily Production:** n.a.
No. Description Group	**Average Productivity:** n.a.
(as required)	**MATERIAL**
	(as required)

RECOMMENDED PROCEDURE:

MAINTENANCE STANDARD

ADMINISTRATIVE OVERHEAD

April 17, 1972 Activity No. 180

DESCRIPTION AND PURPOSE:

This activity includes all supervision not charged to other maintenance activities, annual, sick and holiday leave, and roadway inspection.

SCHEDULING:

N/A

TYPE OF ACTIVITY:

Non-Maintenance

CREW/EQUIPMENT	ACCOMPLISHMENT
Recommended Crew Size: N/A	**Work Unit:** Man-Hour
Equipment:	**Daily Production:** N/A
No. **Description** **Group**	**Average Productivity:** N/A
N/A	**MATERIAL**

RECOMMENDED PROCEDURE: